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Title	Ultrasonic Cleansing Apparatus
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CLAIM

An ultrasonic cleansing apparatus composed of an ultrasonic vibrator positioned at a slight spacing from a cleansing surface of an article being cleansed; and a medium supply pipe provided in the vicinity of said ultrasonic vibrator; characterized in that medium is expelled from said medium supply pipe to form a layer of the medium between a vibrating surface of the ultrasonic vibrator and the cleansing surface of the article being cleansed; ultrasonic vibrations being applied to the article being cleansed through this layer.

DETAILED DESCRIPTION OF THE INVENTION

Field of Industrial Application

The present invention relates to an ultrasonic cleansing apparatus, more specifically to an ultrasonic cleansing apparatus not requiring a cleansing tank.

Conventional Art

Ultrasonic cleansing apparatus which apply ultrasonic vibrations through a medium to an article being cleansed to remove particles (contaminants) adhering to the surface of an article being cleansed are widely used in the process of manufacture of precision parts. These conventional ultrasonic cleansing apparatus use a format in which the medium is collected in a cleansing tank to which the ultrasonic vibrations are applied.

Problems to be Solved

However, in these conventional ultrasonic cleansing apparatus, the ultrasonic properties are highly influenced by the shape and capacity of the cleansing tank in which the medium is collected, as well as the density

(specific gravity) of the medium, thus rendering the design and fine tuning thereof extremely difficult. Additionally, since the cleansing tank must be filled with the medium, a large amount of the medium must inevitably be used, and there is the problem of readhesion of particles that have once been removed. The present invention aims to eliminate the above-described drawbacks of the ultrasonic cleansing apparatus, and offers a novel ultrasonic cleansing apparatus which can perform ultrasonic cleansing without the need for a cleansing tank, and without the possibility of readhesion of particles.

Means for Solving the Problems

The present invention offers an ultrasonic cleansing apparatus composed of an ultrasonic vibrator positioned at a slight spacing from a cleansing surface of an article being cleansed; and a medium supply pipe provided in the vicinity of said ultrasonic vibrator; characterized in that medium is expelled from said medium supply pipe to form a layer of the medium between a vibrating surface of the ultrasonic vibrator and the cleansing surface of the article being cleansed; ultrasonic vibrations being applied to the article being cleansed through this layer, thereby to solve the above-described problems.

Functions

A medium such as water, solvent or the like is expelled from the medium supply pipe, whereby said medium forms a layer between the surface of the article being cleansed and the vibrating surface of the ultrasonic vibrator. Then, ultrasonic vibrations from the ultrasonic vibrator are applied to the article being cleansed through this layer, thereby performing the cleanse by ultrasonic vibrations. The medium supply pipe is made to move in conjunction with the movements of the ultrasonic vibrator, so that a layer of medium is always formed between the ultrasonic vibrator and the surface being cleansed. Thus, the cleansing work can be performed continuously while moving the ultrasonic vibrator. Additionally, by appropriately selecting the angle of the vibrating surface of the ultrasonic vibrator with respect to the cleansing surface, it is possible to prevent such problems as standing waves caused by the application of the ultrasonic vibrations and accumulation of removed particles, as well as eliminating uneven cleansing and solving the problem of bubble removal.

Embodiments

Fig. 1 is a section view of an embodiment of an ultrasonic cleansing apparatus according to the present invention. In Fig. 1, 1 denotes an ultrasonic vibrator, the bottom surface of which is a vibrating surface 2. Additionally, 3 denotes a medium supply pipe, a nozzle 4 being provided on this medium supply pipe for ejecting medium toward the vibrating surface 2, to form a layer 5 of medium between the vibrating surface and the surface 7 of the article 6 being cleansed. As the medium 5, it is possible to use tap water, pure water, alcohol, solvents etc.

In the drawing, 8 denotes a particle stuck to the surface 7 being cleansed. While the frequency of the ultrasonic vibrations applied by the vibrating surface to the surface 7 being cleansed will differ according to the type of particle, it should be roughly in the neighborhood of 28 Hz to 6.8 MHz. Additionally, as shown in the same drawing, the vibrating surface 2 forms a predetermined angle θ with respect to the surface 7 being cleansed, and this ensures the prevention of problems such as the generation of standing waves due to the application of ultrasonic vibrations and the accumulation of removed particles, as well as eliminating uneven cleansing and removing bubbles formed by the ultrasonic vibrations. This angle θ is set somewhere between 0 to 10 degrees according to the respective conditions and applications. In the drawing, 9 denotes a skirt provided at the edge of the vibrating surface 2 in order to stem the loss of the medium due to outflow.

In this embodiment, there is only a single nozzle 4 on the medium supply pipe 3, but a plurality of nozzles 4 may be provided as in the embodiments shown in Figs. 2 and 3, in which case efficient cleansing can be performed over a wide area. Additionally, by using a vibrating surface 2' of a small area as in the embodiments of Figs. 4 and 5, precise partial cleansing of small areas is also possible.

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Effects of the Invention

The present invention, having the above-described structure, does not require a cleansing tank, so that the performance of the ultrasonic waves is not influenced by the shape and capacity of the cleansing tank, nor by the density (specific gravity) of the medium, thus enabling ultrasonic cleansing which is constantly stable. Additionally, the amount of medium which is used can be held to extremely small amounts, so as to be economical as well. Furthermore, the ultrasonic output may be small due to the fact that the distance between the vibrating surface of the ultrasonic vibrator and the surface of the article being cleansed is very short.

Additionally, particles which have once been removed will not have a chance to readhere to the article being cleansed, because the medium is constantly flowing out of the medium supply pipe. Thus, the present invention has many exceptional effects and is highly applicable.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a section view of an embodiment of an ultrasonic cleansing apparatus according to the present invention; Fig. 2 is a perspective view of another embodiment; Fig. 3 is a section view of same. Additionally, Figs. 4 and 5 are perspective view of yet further embodiments.

1 . . . ultrasonic vibrator; 2 . . . vibrating surface; 3 . . . medium supply pipe; 4 . . . nozzle; 5 . . . medium; 6 . . . article being cleansed; 7 . . . surface being cleansed; 8 . . . particle; 9 . . . skirt.

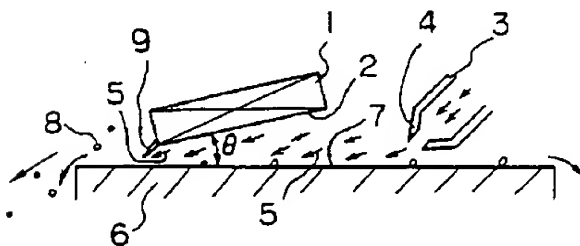


Fig. 1

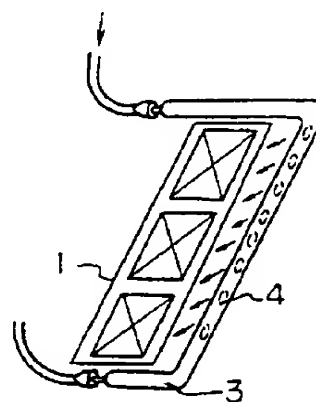


Fig. 2

